

Physics 12

Assignment #7

Forces and Atwood Machines

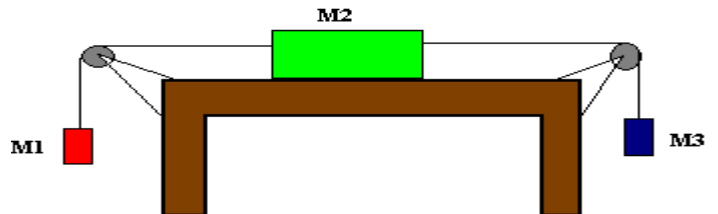
Due Wednesday, May 3rd, 2017

Multiple Choice

1. A modified Atwood machine (like the one below) consists of two masses. The hanging mass is 10kg, the mass on the table is 100kg the coefficient of static friction is 0.3 and the coefficient of kinetic friction is 0.15. Upon releasing the hanging mass the tension in the rope when there is:
a. 98N b) 980N c) 294N d) 147N
2. If the mass on the table in question 1 is changed to 30kg, the tension in the rope would be:
a. 98N b) 53.9N c) 44.1N d) 84.5N
3. Which of the following situations would have a normal force less than the weight of the object?
a) A box sits on a horizontal surface b) A box is being pulled with an upward force
c) A box is being pushed with a downward force d) None of the previous

Problems - Show all your FBDs

4. Hank is pushing a shopping cart that has a mass of 40kg at a constant velocity. a) If the force of friction is 80N, determine the force on the handle if the force is applied at an angle of 55° with the horizontal. b) Determine the coefficient of friction.
5. You are preparing to enter a dog sled race in Nunavut. Your sled, loaded with you and supplies, has a mass of 200kg. After doing research you find that the dogs need 10 meters to reach their constant velocity of 5m/s. Two ropes are attached to the sled, one on each side of the dogs. The ropes pull upward at an angle of 10° . a) What are the tensions in the ropes at the start of the race? b) What are tensions in the ropes after they reach constant velocity? Assume the tension in the ropes is equal. The coefficient of static friction is 0.12 and the coefficient of kinetic friction is 0.06. (Note: Tension is just the force applied by the ropes)
6. A modified Atwood machine is designed like the one below. a) Determine the acceleration of the masses if mass 1 is 5kg, mass 2 is 40kg and mass 3 is 10kg. The coefficient of friction is 0.100. b) Which cable has a greater tension? Explain.



Practice

7. How much acceleration would there be if I pulled on a child's toboggan with a force of 150 N at an angle of 55° ? The toboggan has a mass of 25 kg, and the coefficient of friction is .124.
a) 4.78 m/s^2 b) 2.23 m/s^2 c) 2.84 m/s^2 d) 1.62 m/s^2 e) None of the previous
8. The smaller mass on an Atwood machine is 40kg. If the tension in the rope is 500N, the second mass is:
a) 27.72kg b) 70.42kg c) depends on direction of motion d) none of the previous

9. A modified Atwood machine is set up such that one mass is sitting on a table top with a coefficient of friction of 0.25. It has a mass of 100 kg and is attached to a hanging mass. a) Determine the acceleration of the masses if the hanging mass is 20kg. b) Determine the acceleration of the masses if the hanging mass is 50kg. c) Determine the tension in the string.

